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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/559,826	12/06/2005	Yasuhiko Otsubo	960/197	3639

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EXAMINER	
NGUYEN, TU MINH	

ART UNIT	PAPER NUMBER
3748	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/559,826	OTSUBO ET AL.	
	Examiner	**Art Unit**	
	TU M. NGUYEN	3748	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 19 August 2008.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,5-8 and 10-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,5-8 and 10-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 06 December 2005 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date 20080520.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

1. An Applicant's Amendment filed on August 19, 2008 has been entered. Claims 1, 7, and 11 have been amended. Overall, claims 1, 2, 5-8, and 10-14 are pending in this application.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 2, 5-8, and 10-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawashima et al. (U.S. Patent 6,851,258) in view of Tashiro et al. (U.S. Patent 6,622,480), Schaller et al. (U.S. Patent 6,948,311), and Boretto et al. (U.S. Patent 6,941,750).

Re claims 1, 7, and 11, as shown in Figures 1, 4, 5, and 8-11, Kawashima et al. disclose an exhaust purifying apparatus and an exhaust gas purifying method for an internal combustion engine, the apparatus comprising:

- an estimation unit (see Figure 8) that estimates an accumulation amount of particulate matter trapped about a catalyst (41) in an exhaust system based on a pressure loss across the catalyst, and

- a control unit (31),

wherein, when the pressure loss is equal to or more than a permissible value (step S13 with YES answer), the control unit executes PM elimination control (step S15) for supplying unburned fuel component to the catalyst to increase the temperature of the catalyst and burning the trapped particulate matter (see lines 52-62 of column 13), and

wherein, when execution of the PM elimination control becomes possible (step S41 with NO answer, step S45 with YES answer, and step S46) after suspension of the control (step 42 with YES answer, step S43 with NO answer, and step S44), the control unit resumes the PM elimination control even if the accumulation amount of particulate matter about the catalyst is less than the permissible value (see Figures 5, 9, and 10 and line 23 of column 9 to line 67 of column 10).

Kawashima et al., however, fail to disclose that instead of the pressure loss, the accumulation amount is used to initiate PM elimination control; that the estimated accumulation amount is set to zero at the completion of the PM elimination control; and that at a final stage of the PM elimination control when the estimated accumulation amount is slightly more than zero, the apparatus executes burn-up control, in which performance and stopping of concentrated intermittent fuel addition to a section of the exhaust system that is upstream of the catalyst are repeated a predetermined number of times so that the catalyst temperature in the burn-up control is higher than 650^{o}C and higher than the catalyst temperature at the time the estimated accumulation amount is less than the determination value in order to burn up particulate matter that is deposited at an upstream end of a particulate filter.

As shown in Figures 1 and 8, Tashiro et al. disclose a method to control the regeneration of a particulate filter (4). As depicted as step S21 in Figure 8, Tashiro et al. teach that it is conventional in the art to estimate an accumulation amount (PMs) of particulate matter in the filter and when PMs is greater than or equal to a threshold value (PMmax), a PM elimination control is initiated. Also in step S36, Tashiro et al. also teach that the estimated accumulation amount is set to zero at the completion of the PM elimination control. It would have been obvious to one having ordinary skill in the art at the time of the invention was made, to have utilized the teaching by Tashiro et al. in the apparatus and method of Kawashima et al., since the use thereof would have been routinely practiced by those with ordinary skill in the art to control a regeneration step of a particulate filter.

As shown in Figure 1, Schaller et al. disclose a method to control the regeneration of a particulate filter (115b). As illustrated in Figure 3, Schaller et al. teach that it is conventional in the art to intermittently inject a fuel into an exhaust stream ahead of the filter at a final stage (third phase) of a particulate matter elimination control when an accumulation amount of particulate matter in the filter is slightly more than zero in order to maintain the filter at a desired temperature range (also see the Abstract and claims 1 and 4), wherein the filter temperature in the third phase is higher than 650°C and higher than the filter temperature at the time of a second phase where the injected fuel is at a constant rate (see lines 10-19 of column 2, lines 46-65 of column 4, and lines 22-25 of column 7). It would have been obvious to one having ordinary skill in the art at the time of the invention was made, to have utilized the teaching by Schaller et al. in the apparatus and method of Kawashima et al., since the use thereof would have been routinely

practiced by those with ordinary skill in the art to prevent excessive temperature rise in a filter during its regeneration.

As shown in Figure 1, Boretto et al. disclose a method of determining an amount of particulate accumulated in a particulate filter (9). As illustrated in Figure 3b, Boretto et al. teach that during a regeneration step of the filter, the particulate matter in the channels at a periphery of the filter (i.e., further away from the center of the filter) is burned at a later time. Because of this, after a partial regeneration situation such as a suspension in Kawashima et al. or at the beginning of the third phase in Schaller et al., there is still particulate matter remaining in the peripheral channels at an upstream location of the filter. Thus, based on the teaching by Boretto et al., it would have been obvious to one having ordinary skill in the art at the time of the invention was made, to have realized that Schaller et al. perform the intermittent fuel addition during the third phase in order to burn up particulate matter that is deposited at an upstream end of the filter.

Re claims 2 and 8, in the modified apparatus and method of Kawashima et al., when resuming the PM elimination control, the smaller the accumulation amount, the shorter the time for execution of the PM elimination control is set by the apparatus (see for example, Figure 9).

Re claims 5 and 10, in the modified apparatus and method of Kawashima et al., the apparatus discretely increases the temperature of the catalyst after resuming the PM elimination control, as clearly shown in Figure 9.

Re claim 6, the modified apparatus of Kawashima et al.:

- burns unburned fuel collected on the catalyst in an early stage of the increase in the catalyst temperature (lines 52-62 of column 13); and

- further increases the catalyst temperature thereafter, thereby burning particulate matter collected on the catalyst.

Re claims 12-14, in the modified apparatus and method of Kawashima et al., as illustrated in Figure 3 by Schaller et al., concentrated intermittent fuel addition is repeatedly performed and stopped in the burn-up control.

Response to Arguments

4. Applicant's arguments with respect to the references applied in the previous Office Action have been fully considered but they are not persuasive.

Re claims 1, 7, and 11, in response to applicant's argument that the prior art of record fail to teach or suggest "the intermittent fuel addition increases a catalyst temperature so that the catalyst temperature in the burn-up control is higher than 650°C and higher than the catalyst temperature at the time the estimated accumulation amount is less than the determination value" (page 7 of the Applicant's Amendment), the examiner respectfully disagrees.

The text on lines 50-65 of column 4 in Schaller et al. reads as follows:

"*According to the present invention, a fuel quantity is metered in such a way that the temperature increases to a value that is required for the regeneration of the particulate filter. The regeneration of the particulate filter takes place at temperatures above a certain value, which typically lies in the range of 300°C and 650°C, depending to an extent on the particular design of the exhaust gas aftertreatment system and the nature of the particulate layer in the filter.*

At exhaust gas temperatures that are too high, the particulate filter may be damaged by overheating. This is a particular problem if a large quantity of particulates in the filter is converted, leading to an additional temperature increase. If, on the other hand, the exhaust gas temperature is too low and/or the gas volume flow in the exhaust gas is too high, a part of the fuel is reacted in the oxidizing catalytic converter and the rest gets out uncombusted into the environment."

Based on the above disclosure, Schaller et al. perform a second phase of regeneration during which a fuel is injected into the exhaust at a constant rate until a filter temperature reaches a temperature as high as 650°C where the trapped soot begins to combust. As the trapped soot burns, thermal heat is released and the filter temperature is expected to rise beyond 650°C. This is consistent with Kawashima et al. (see Figure 22D and lines 16-28 of column 5) who disclose that a filter bed temperature (tTbed) as high as 650°C is needed to have the trapped soot self-ignited; and that as the trapped soot burns, the filter temperature is increased beyond 650°C and even approaches a maximum allowable limit.

Schaller et al. then injects fuel into a particulate filter in an intermittent manner so that a filter temperature during the third phase of its regeneration does not exceed a maximum allowable limit that causes thermal damage to the filter and does not drop below a minimum allowable limit that causes a part of the injected fuel uncombusted. The filter temperature during this third phase is thus oscillated within a desired range defined by the maximum allowable limit and the minimum allowable limit. During the third phase where the fuel is intermittently injected into the filter, Schaller et al. attempt to prevent the filter temperature from dropping below the desired range (see lines 22-25 of column 7). However, the burning of the remaining

soot and the injected fuel in Schaller et al. will undoubtedly increase the filter temperature to a level near to the maximum allowable limit. That's why the fuel in Schaller et al. is stopped during the intermittent injection to prevent the filter temperature from exceeding this maximum allowable limit. The temperature level near to the maximum allowable limit is clearly higher than an average temperature or the minimum allowable limit for the filter in Schaller et al. during the third phase of regeneration. Thus, Schaller et al. at least teach or suggest the claimed limitation in dispute.

Conclusion

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Prior Art

6. The IDS (PTO-1449) filed on May 20, 2008 has been considered. An initialized copy is attached hereto.

Communication

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Tu Nguyen whose telephone number is (571) 272-4862.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Thomas E. Denion, can be reached on (571) 272-4859. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Tu M. Nguyen/
Tu M. Nguyen
Primary Examiner
Art Unit 3748

TMN
December 5, 2008